a much higher percentage of people receives specialist inpatient palliative care.

Many more people receive specialist palliative care in their home or in hospital. The results of the survey for 1992, which are being collated now, include the number of patients seen by home care nurses. Questionnaires were sent to the 360 teams listed in a directory of hospice and palliative care services.[3] Altogether 198 teams replied that they had seen 54816 patients during the year. This implies that, with 360 teams, about 99000 patients were seen by a home care service. It thus seems that almost two thirds of patients dying of cancer are seen by specialist home care (including Macmillan) nurses. Yet more patients are seen by hospital support (palliative care) staff, and we hope to estimate this figure in a future survey. The palliative care services do reach a considerable proportion of people in need of palliative care, including more than half of those dying of cancer.

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Helping sick doctors

EDITOR,—The Department of Health contributes 5p a year for each "sick doctor," while Marks and Spencer spends about £85 a year on occupational health care for its employees. Territorial imperatives of the royal colleges demand that even a mature, experienced specialist in one subject can gain access to another college only if he or she can surmount the obstacles designed to test beginners. Public and private employers in the health sector fail utterly in the rehabilitation and redeployment of their colleagues while doing what is good for everybody else.

The chief medical officer is taking steps to lead colleagues to an understanding of the problem. The Occupational Health Committee is doing its best to ensure that competent professionals are made available to protect from their managers and colleagues the "rejects" for whom Norman W Lees is so eloquent an advocate.[1] Meanwhile, neither the NHS's claim to being an exemplary employer nor doctors' committment to the support of their colleagues is credible.

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Asthma in cross country skiers

EDITOR,—Kjell Larsson and colleagues described the high prevalence of asthma and increased bronchial responsiveness in cross country skiers in Sweden.[1] They attributed their findings to the skiers breathing large volumes of cold air during strenuous exercise. They should, in addition, consider other factors causing bronchoconstriction such as humidity, hypocapnia, and hypoxia.

Absolute humidity is depressed at reduced temperatures. Thus even if the air is fully saturated with water vapour the actual amount of water will be small at low temperatures. For example, the water vapour pressure at 20°C is 17 mm Hg but it is only 1 mm Hg at −20°C. At the environmental temperatures quoted by Larsson and colleagues air is not only cold but also very dry. Dry air causes more bronchoconstriction after exercise in asthmatic subjects than does humidified air.[2]

During strenuous exercise arterial carbon dioxide tension falls slightly, and Newhouse *et al* have shown that hypocapnia causes a consistent increase in flow resistance during sustained voluntary hyperventilation.[3] End tidal carbon dioxide pressures are needed to determine the role of bronchoconstrictive hypocapnia in cross country skiers. If the skiers had been competing at high altitude (unlikely in Sweden) their hypoxic ventilatory response might have caused further hyperventilation and a greater degree of hypocapnia.

Hypoxia causes bronchoconstriction in experimental animals,[4] and an acute increase in airway resistance occurs in humans breathing a normocapnic hypoxic gas mixture.[5] Larsson and colleagues did not mention altitude in their study, but in European countries where athletes can ski at high altitude hypoxia induced by altitude may cause bronchoconstriction.

Although breathing large volumes of cold air during vigorous exercise is probably the main cause of increased bronchial responsiveness and asthma in Swedish cross country skiers, other intriguing factors may have a contributory role.

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Osteoporotic fractures

Target whole population for prevention

EDITOR,—Tuan Nguyen and colleagues combined measurements of bone mineral density, muscle strength, and postural stability to predict osteoporotic fractures.[1] This outperforms many previous protocols, but their use of discriminant function analysis to derive sensitivity figures in excess of 80% is both unusual and potentially misleading. The term sensitivity should have been reserved for the proportion of people subsequently sustaining fractures who had had a positive test result (in this case a combination of poor results for bone mineral density, muscle strength, and postural stability). Data in the authors' table IV show that, with subjects in the worst quartile of all three variables being defined as positive, the sensitivity over the follow up was nine out of 38 fractures (24%) in men, and 26 out of 104 fractures (25%) in women. For the women, making the criteria less stringent to deliver a sensitivity of 86% results in 68% of the total population being labelled at risk. Receiver operating curves provide a graphical illustration of the trade off between sensitivity and specificity. The authors' use of the discriminant model in plotting their receiver operating characteristic curves is erroneous and exaggerates the clinical importance of the findings.[2]

The authors term their classification highly specific. This must be judged in the context of the low number of fractures in all groups. The overall incidence of 142 fractures in 1789 subjects means that tossing a coin would predict not sustaining a fracture with a specificity of 92%. The methods described in this paper identify a small "high risk" population. However, although the subjects in the worst quartile of all three variables had a high relative risk, only 25% of fractures occurred within that group. The case for screening for such subjects is weak. Furthermore, intervention at such an advanced stage may be ineffective and costly. The authors do not claim this should be done, but citing inflated sensitivity and specificity figures does little to help doctors decide when to investigate (or refrain from investigating) their patients.

Morbidity due to fractures in elderly patients is a problem that will yield only to measures adopted by most of the population. Much has been written about the relative inefficacy of targeting individuals in the tail of a distribution when even the average subjects are unnecessarily at risk.[3] Nguyen and colleagues highlight important factors, but it is only by universally promoting physical activity, hormone replacement therapy, and stopping smoking that we will substantially reduce the toll of osteoporosis.

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Authors' reply

EDITOR,—The reference cited by Malcolm Duncan[1] in no way suggests that our modelling approach was erroneous; in fact, in principle it indicates that our use of this technique was totally appropriate. Sensitivity and specificity (that is, receiver operating characteristic curves) can be calculated from a single variable by treating the variable as either continuous or categorical data. In a more complex situation several variables need to be combined into a single, non-random, and functional variable so that the receiver operating characteristic curve can be established. In our data the linear logistic function was found to be suitably empirical, and so the best estimates of this function were used to construct discriminant levels. In this approach bone density, quadriceps strength, and sway were treated as continuous not quartile based data. The suggestion that clinical decision analysis is more applicable in this situation may be the case when the performance of a laboratory test is assessed, but it is not appropriate for our population based epidemiological study of risk factors for fracture. Duncan's coin analogy refers to the predictive value of a test and not to its specificity. The predictive value varies, whereas specificity and sensitivity remain constant with the prevalence of a disease. Our derived sensitivity and specificity are true for our population; they are neither exaggerated nor underemphasised.

We consider that 68% of the elderly female population being at risk of fracture (although the actual figure is 71%) is cause for concern. We agree that, for any measure to be successful at decreasing overall fracture risk, it would have to be applied at a population level. Whether our findings apply to other populations must be evaluated, a point which we made clearly in our original article. Moreover, our findings emphasise that age is a surrogate for low bone density and postural instability, both of which are potentially important points of attack for population based prevention. On the other hand, there is still no compelling evidence to support